

Wind Cave National Park Bison Flats Prescribed Fire Monitoring Report

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Introduction

The Bison Flats prescribed fire is a 1848 acre unit comprised of both native and non-native mixed grass prairie with isolated stands of Ponderosa Pine. It is located in the southern portion of Wind Cave National Park. The boundary of the burn area consists of Park boundary on the south and east flanks, to the north is a large prairie dog town, and to the west is Highway 385. Ignition of the unit commenced at 1012 on October 8th, 2001 following a test burn successfully initiated near the area of drop point two (see attached map) at the division B/C break. Ignition concluded at 1900 of the same operational period.

Overhead personnel for the Bison Flats burn consisted of Burn Boss Denny Ziemann and three Division Supervisors, Steve Ipswich, Dan Morford, and Jim Dahlberg, who also acted as ignition specialists along their division lines. Holding forces included six Type VI brush engines, three twenty-person handcrews, and two Type III water tenders. Additional resources included the presence of the Black Hills Fire Use Module and various personnel from Wind Cave and Badlands National Parks and Scotts Bluff National Monument.

Objectives

Primary resource objectives for the burn:

- Increase native grass and forb cover.
- Decrease decadent thatch in prairie areas to create more nutritious vegetation for wildlife forage and habitat.
- Increase the vigor of native perennial forbs.
- Decrease the dead and down (1-, 10-, and 100-hr.) fuels in draws and wooded areas.
- Create a mosaic of burned shrubland to decrease fuel continuity.

Summary of Events

Prior to the day of the burn, personnel from the Wind Cave engine staff and various employees from the park prepared for the burn with a mowline around the eastern portion of the burn unit, established a 12,000 foot hose lay on Divisions B and C, posted "division break" and "drop point" signs, prepared drip torch mix and mowed around trail posts within the burn unit. Porta tanks, pumpkins, Mark III and Floata-pumps were established strategically around the perimeter of the burn unit. The unit boundaries were checked for and cleared of dead and down fuel in timbered sections.

Five long-term fire effects monitoring plots were installed at various points within the burn unit. Biomass, fuel and soil moistures were calculated within the monitoring plots.

A briefing was conducted for all personnel present at 0730 on the morning of the burn. A National Weather Service spot forecast and on-site weather observations were obtained to assess compliance with prescription parameters. Prescription criteria was met and ignition of the burn unit commenced at 1012 and ceased at 1800. Some additional blacklining occurred along the prairie dog town that comprised the northern boundary. This was done as a contingency measure to prevent the possible spread of fire through the dog town. The contingency ignition ceased at 1830. Post-burn evaluations began the following day.

Weather Observations

Monitoring of weather conditions for the Bison Flats Prescribed Fire began at 0645. Three observations were taken before the briefing began at 0730 in order to obtain a spot weather forecast from the National Weather Service. As of 0800, observations were taken every half hour until ignition was completed at 1800, with the observations on the hour being broadcast over the command channel for all fire personnel. On 8 October 2001 the temperatures during ignition ranged from 63 to 67 degrees Fahrenheit. Winds were variable during the burn period. Note that the long term and spot weather forecasts both predicted northwest winds at 5 to 15 miles per hour. Before and during briefing, weather observations taken by the fire monitors recorded north winds well within the prescription parameters. However, by the time the test burn was lit, winds were out of the south. Winds were south/southeast and upslope between 1000 and 1100, then were predominantly out of the southwest throughout the remainder of the burning period. Late in the day winds became more westerly and wind speeds increased. By 1400, wind speeds were between 7 and 10 mph with gusts up to seventeen. Observed and predicted weather conditions are summarized in Table 1.

Table 1, Weather Conditions Observed on 10/08/01

Condition	Temperature	Relative Humidity	Wind Speed (mph)	Wind Direction	1-Hr Fuel Moisture
Prescription	35-90	20-50%	2-10 (prairie), 4-11 (forest)	south/west	4-11
Predicted	65-70	20-26%	3-9	northwest	8
Observed	63-72	31-37%	2-13, gusts to 17	south and west	9-11

Ignition Pattern

Ignition occurred at 1012. The test burn began at drop point 3 in the southeast corner of the burn unit. Two ignition teams, commenced lighting in opposite directions with Division B progressing from drop point 3 to the north toward the prairie dog town and Division C progressing south and west towards drop point 2 and Highway 385. Due to the easterly component in the south wind, however, Division B halted ignition in order to re-deploy ignition and holding resources in order to progress from the prairie dog town south to drop point 3. By 1300 Division C had tied in to drop point 2. By 1445 Division B had tied in to drop point 3. Division A commenced ignition on the north side of the unit at the intersection of the prairie dog town and Highway 385 at 1230. By 1430 Division A had ignited down to the Wind Cave National Park Interpretive Sign mid way between drop point 1 and the Division A/C break. At 1530 Division A continued with ignition, lighting from the Division A/C break and bringing fire north along the highway until the line was tied in at the interpretive sign at 1630. Blacklining of the unit was completed by 1830 with a contingency black line being run through the prairie dog town from the Division A/B break to the intersection of the prairie dog town and Division B on the eastern perimeter of the fire. At various times throughout the burn period when ideal conditions existed Verry pistols were used to ignite the interior of the unit. The Division C ignition team ignited the north aspect of Gobbler Ridge at 1500. (see attached map, unless this is forwarded electronically).

Fire Behavior Observations

Fire behavior observations were taken regularly during the day in both fuel types 1 and 2 and on different aspects and slopes. The highest intensity burning occurred between the hours of 12:00 and 15:00. Flame lengths ranged between 4 and 8 feet in fuel model 1 (both native and non-native mixed-grass prairie). Rates of spread for head fire in Little Bluestem ranged between 10 and 50 chains an hour. In fuel model 1 Kentucky Bluegrass, flame lengths were observed at 6-12" with rates of spread for head fire between 5 and

10 chains per hour. In fuel model 2 a rate of spread of 15 chains per hour was observed at 1500. This was on Gobbler Ridge where westerly gusts of 17 miles per hour were observed. Isolated torching of Ponderosa Pine occurred during the burn. Fire behavior observations are summarized in Table 2.

Table 2, Fire Behavior Observed on 10/08/01

Time	Fuel Model	Fire Type	Rate of Spread (ch/hr)	Flame Length	Flame Zone Depth	Comments
10:25	1	backing, flanking		10"-18"	6"-8"	
10:30	2	backing, downslope	3.5	6"-2'	6"-1'	downslope winds caused short headfire with spotting 2-4' ahead of fire
11:35	1	head	40	4'	8'	
12:10	2	backing, flanking	4	1'-1.5'	6"-1'	partially shaded fuels
12:15	2	head, flanking	n/a	4-7'	6-8'	
13:00	2	backing, flanking	6	4-5'	10-12'	
14:00	1	head	n/a	n/a	n/a	no rate of spread
14:00	1	flanking	8	12-18"	12"	
14:05	1	head	20	2-4'	3-4'	
14:10	1	head	n/a	6-12"	2'	
14:15	1	head	10	n/a	n/a	intense smoke and rates of spread
14:30	1	head	50			winds 10-15 mph out of the west
15:00	2	backing	2	1-2'	1'	
15:15	2	backing	n/a	6"	6"	
15:30	2	head	15	6'	6'	burnout on Gobbler Ridge
15:30	2	backing	2	6-8"	2-6"	5' scorch on pipo
15:30	2	torching	n/a	20-25'	n/a	single tree torching
15:45	2	backing	0.5	6-16"	6"	

Biomass and Soil Moisture Measurements

Fuel loading and soil moisture samples were taken at the long term monitoring plots on the day before the burn. Three samples of a known area were clipped to determine biomass or fuel loading by tons per acre. The sample fuel loading was on average 2.93 tons per acre and varied from 1.94 to 3.71 tons/acre in the prairie and 10.28 tons/acre in the forested areas. Three soil moisture samples were taken within 5cm of the surface at each of the five plots. Samples were weighed and dried to obtain a mean soil moisture for the unit. The average soil moisture was 18.76% in the prairie and 28.04% in the forest.

Smoke Monitoring

Smoke impact to nearby private residents and the town of Hot Springs was a primary concern on the Bison Flats Burn. Due to wind direction on October 8th, smoke did not impact the visibility on highway 385 south and west of the burn unit. Fireline visibility was fair to good along the north line, with holding crews exposed to a significant amount of smoke along the east line. Smoke dispersal was good until 1800 when the smoke settled into Buffalo Gap east of the park.

Fire Monitoring

Five long-term fire-monitoring plots are located within the Bison Flats unit. Two plots are native mixed-grass prairie, two plots are non-native prairie, and one plot is a Ponderosa Pine forest plot with a grass understory. These plots were read immediately post-burn to determine burn severity of vegetation and substrate (litter and soil) and will be read 1, 2, 5, and 10 years after treatment of fire to determine the immediate, short, and long term ecological and vegetative effects fire had on this burn unit.

Conclusions

The long-term health of ecosystems is the focus of the prescribed burning program here in the Northern Great Plains and at Wind Cave National Park, therefore certain criteria need to be assessed. Some objectives are immediately measurable such as reduction of decadent thatch in prairie by at least 85% post burn). Other quantifiable specific objectives need to be viewed over the course of several years before results can be determined. With a long term ecological monitoring program in place, a quantifiable assessment of prescribed fires specific objectives can be made.

Resource Objective	Monitoring Status
Reduce non-native cover by 50-90%: increase native perennial grass cover by 50-90%; increase native forb cover by at least 50% within 5 years postburn	Two native mixed-grass prairie plots and two non-native mixed grass prairie plots will be read 1, 2,5, and 10 years post burn to quantify these objectives
Achieve greater than 50% mortality in Ponderosa Pine regeneration (<2.5 cm dbh) within 2 years postburn	One Ponderosa Pine monitoring plot will be read 1, 2, and 5 years post burn to quantify these objectives
Reduce dead and down (1-, 10-, and 100-hr.) fuels by 30-50% immediate post-burn	One Ponderosa Pine monitoring plot will be read 1, 2, and 5 years post burn to quantify these objectives
Reduce dead and down (1-, 10-, 100-hr) fuels in draws 30-50% immediate postburn.	One Ponderosa Pine monitoring plot will be read 1, 2, and 5 years post burn to quantify these objectives
Reduce total biomass in prairie areas by greater than 60% immediate postburn.	Immediate post-burn sampling showed a reduction in biomass in prairie areas by 86%